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The Last Wolves of Isle Royale

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The Last Wolves of Isle Royale

Chairperson: Joe Eaton

Abstract Content: Isle Royale National Park, located in Michigan, is home to a wolf population that is in decline due to complications from inbreeding. Scientists and managers struggle to decide whether to intervene. Some scientists promote bringing new wolves to the island to restore the population because they say the decline is human-caused. Others promote “watchful waiting.” To date, the National Park Service has not interceded and is currently undergoing a management planning process. The issue raises questions about what it means to manage wildlife in an era of change. Should humans intervene to protect wildlife in the face of climate change and human impact?

The Last Wolves of Isle Royale

By Kasey Rahn

Lake Superior in February looked like a frozen desert, spread out in shades of gray. Ice spanned out toward the horizon, a cold blue-gray where the trapped lake pressed up from below. On the shoreline, it balled up into great, gray mounds.

Usually, the sky is laced with silver clouds, heavy with snow, and the wind whips across the island. Today, though, it was calm, and the sky was a bright, blinding blue after so many days of gray. The temperature hovered around -5 degrees F.

Three wolves moving north towards Herring Bay on Isle Royale, a small national park 55 miles off Michigan's Upper Peninsula, appeared impervious to the cold, wrapped up in thick gray coats of winter fur.

They face troubles much more dangerous than the cold. They go bone deep. Like so many of their ancestors, which came to the island via ice bridge in the 1940s, the wolves suffer from inbreeding, which has diminished their ability to hunt and reproduce, and is swiftly driving their population to extinction.

Two were dark gray adults, a signature color for Isle Royale wolves. Together, they led the group's travels. Neither wore a radio collar.

The third wolf trailed behind, a subordinate. Based on its size, the researchers estimated it was a nine-month-old pup, a surprise since they hadn't detected any signs of reproduction over the summer. Even for a pup, though, it was small – and startling.

Its belly was sickly skinny, despite its two adult companions appearing well fed. Its tail was short, half the length it ought to be, and capped in two dark stripes like a raccoon, a characteristic researchers had never seen before on Isle Royale. Its gray back was hunched into an arc, emphasized by the pup's gangly legs. The guard hairs on its neck bristled upright in wild disarray.

It didn't take a scientist to tell you the thing looked unhealthy.

If the trio of wolves paused long enough to glance skyward, they might have noticed a small plane, called Flagship, following them from above. The plane carried a pilot and a researcher from a scientific project that has studied the interplay of wolves and moose on the island for 57 years. If they noticed, the wolves didn't stop. They trotted on, traveling across three miles of hard packed snow and bare ice.

From above, the two men watched the last three wolves on Isle Royale disappear into a thick cover of fir trees.

Isle Royale is one of the least visited national parks in the country. A 206 square-mile island in Lake Superior, it often sees fewer people in a season than Yellowstone sees in a day. Trimmed by rocky shorelines, it's accessible by boat or plane only in the summer. It's empty of humans in winter, except for a small number of park staff and researchers from the wolf-moose project, the longest running predator-prey study in the world.

For wolves, the only way on or off the island is by ice bridge. But due to climate changes, ice bridges are uncommon, which has isolated the Isle Royale wolves and caused their decline. Their fate is now in the hands of scientists and government officials.

Many scientists believe the solution is simple, that wolves from elsewhere should be brought to the island. But another school of thought, which so far is winning out with National Park Service officials who set policy at Isle Royale, is that the best way to manage nature is to leave it alone. The process of wolf decline on the island is natural, these scientists say, and one that humans should not interfere with.

The dilemma posed by the Isle Royale wolves illustrates a debate over whether or not humans should meddle on behalf of animals and plants to ensure their survival. And if so, under what circumstances?

It's a question scientists expect to struggle with more often as the planet warms and human influence spreads to even the most remote places. And so far, it's a question that has divided the scientific community and policymakers, including those who will decide the fate of wolves on Isle Royale.

Broken backs, broken packs, and the effects of inbreeding

Public attitudes towards mainland wolves in the Great Lakes Region can be unpredictable. Wolves flip-flop on and off of the Endangered Species List (they're currently listed), receiving federal protection when they're listed and variable management from individual states when they're not.

When Michigan held its first wolf hunt in 2013, animal rights advocates, mostly from the wolf-free Lower Peninsula, and hunters waged war at the polls. The battle hadn't reached its climax when wolves were placed back on the Endangered Species List in December.

In most of the Upper Peninsula of Michigan and northern Minnesota, wolves live in contention, like in much of the western U.S. But on Isle Royale, a federally designated wilderness area, managers have carved out a place for wolves. On Isle Royale, they've become part of a wilderness atmosphere people take great pains to escape to. Yellowstone is known for Old Faithful; Isle Royale is known for its wolves.

But beneath their deceptive beauty, Isle Royale wolves are suffering from the effects of inbreeding. Many have twisted, malformed spines – congenital bone deformities from inbreeding. Some have extra vertebrae. Some have asymmetrical vertebrae segments with missing processes, the arms of bone that extend out from the central vertebrae. Most have vertebrae that are fused into twisted masses, called lumbosacral transitional vertebrae, which researchers say may cause nerve damage, paralysis, and loss of control in the rear legs and tail.

The wolves are weaker, generally less fit, reproduce less, and lead short lives. Lately, packs have had less success hunting, despite moose being abundant. It's a downward spiral the packs can't recover from. From 2009 to 2015, the number of wolves declined by 88 percent, down from 24 in 2009.

For animals, like humans, genetic diversity leads to resilience. Wolves in Yellowstone, for example, display relatively high genetic diversity. They move freely between packs and populations, and as they move, they bring genetic diversity with them.

Small, isolated populations, like on Isle Royale, often don't have that luxury of movement. Without immigration, inbreeding depression can occur, reduced health and fitness in a population as a result of inbreeding that can accumulate over generations.

To combat inbreeding depression, new genetic material has to enter the population. This can occur naturally, with wolves immigrating into the inbred population. Or, this can happen artificially, often through a process called genetic rescue, in which humans introduce wolves to add new genetics.

Genetic rescue has happened, in a sense, naturally before on Isle Royale. The Isle Royale wolf population declined from 50 to 14 from 1980 to 1982, and stayed low for more than a decade. Then, in 1997, a wolf known as Old Grey Guy immigrated to the island via an ice bridge and breathed new life into the genetics of Isle Royale. Wolves began to display improved health and fitness.

Researchers didn't discover his immigration until 2011, thanks to advances in genetic analysis. Reexamination of data suggested that his arrival wasn't an isolated event.

It had previously been thought that the wolves of Isle Royale had somehow mysteriously – and almost miraculously – avoided inbreeding depression, something rare for an island population. But it turns out that wolves in the past likely travelled to Isle Royale frequently across ice bridges that connect the mainland to the island.

A wolf could cross the ice bridge in less than six hours. This connection, this connectivity, facilitated natural genetic rescue.

But genetic health requires that new genes enter the population over and over again – not just once. With ice bridges becoming less frequent, that isn't happening.

Since the population has been studied for decades, the decline on Isle Royale isn't a surprise, said Fred Allendorf, a biology professor emeritus at the University of Montana who specializes in population genetics. The situation is predictable for a small, isolated population.

Allendorf hasn't taken a position on the plight of Isle Royale wolves, but he said that, from a biological standpoint, new wolves would need to be brought to the island if you indeed wanted to maintain a population.

Bringing new wolves to the island, and genetic rescue, specifically, would be a long-term commitment though.

"The population is too small to be viable in the long run without constant management," Allendorf said.

He also said he thinks that the term ‘genetic rescue’ is misleading, since it is a short-term fix. “The population will always be small,” he said. “It’s just a way to temporarily kick the can down the road, so to speak.”

Two new wolves come to Isle Royale

This winter was bitterly cold on Isle Royale, but the wolf-moose study went on from late January to early March.

There’s no such thing as a typical day during the long-term study. The day’s activities are dictated largely by the weather.

Some things, however, are consistent from year to year.

Ground crews trudge through deep snow, following moose tracks. When they come across yellow urine patches or dark moose droppings, they collect samples to analyze for moose nutrition data.

On calm days flight crews get up by 4 a.m. to hook up a generator to warm the engine of the airplane. By daybreak, the pilot, who’s flown with the project for over 30 years, has the plane up in the air. Together with one researcher, he circles the island, tracing lakes and waterways and searching for just about anything they can find from the plane’s tiny windows: counting wolves, counting moose, and observing behavior.

If a wolf kill is found, researchers spend a day hiking to the moose carcass. Like medical examiners, they then perform a necropsy to gather clues about the moose’s life and death.

On February 15, the pair in the plane found the infamous Group of Three - the last wolves on Isle Royale. After the animals disappeared, researchers noticed a pile of vomit left behind by one of the wolves.

A raven had landed beside the pile and was attempting in vain to consume it. But the vomit had frozen solid. The researchers landed the plane, and cleaved the frozen puke into a plastic bag, in the hope that DNA analysis would shed light on the identity of at least one of the mystery wolves.

It was the last time researchers had seen evidence of the three wolves, except one faint scattering of paw prints that had lead nowhere.

Now, on February 26, it was windy, but the day was conducive to flying. From the plane’s small window, researchers spotted two wolves, curled into balls while they slept.

The wolves weren’t from the Group of Three. These were different wolves. Hope unfurled. It seemed there were more than just three wolves left – the population, with the addition of two new wolves, would count to five at least.

That afternoon, the pilot and another researcher tracked down the two wolves to further investigate, but any hope that there were more than three Isle Royale wolves left was quickly crushed. It was easy to see, once the two wolves were awake and moving, that they didn’t belong to Isle Royale after all.

One wolf was very petite, but healthy looking. The larger wolf's fur was light – not a shade of gray that usually marks coat color on Isle Royale. On closer inspection, it would later be revealed that the wolf was also sporting a radio collar, and all of the wolves that had once been collared as part of the Isle Royale study were dead.

The two wolves were from the mainland, from Minnesota, and the radio collar was part of a study conducted by the Grand Portage Band of Lake Superior Chippewa. The wolves had come to the island via ice bridge only the day before.

For a moment, hope blossomed again. Maybe the wolves could save themselves, after all. Maybe these new wolves would stay, would recolonize a dying island, and bring a much-needed genetic boost. The radio-collared wolf was a young wolf dispersing, after all, leaving its birth pack in hopes of finding open territory and a mate. The other wolf was perhaps a sibling, along for the adventure.

The next day, researchers followed the wolves again as the animals explored the southwest portion of the island. Later on, researchers watched the pair crest a ridge and speed toward the ice of Superior, running out towards the plains of white at a pace that would return them to the mainland in only a few short hours. As they left the island, they carried away any remaining hope away with them.

Return the wolves: the case for intervention

John Vucetich, a leader of the Isle Royale wolf-moose project, has worked on the island since the '90s. An associate professor at Michigan Technological University who sports a long brown ponytail, he has long promoted bringing new wolves to Isle Royale.

The first time I heard Vucetich speak about genetic rescue, Michigan was just beginning to consider its first wolf hunt in the Upper Peninsula in 2010. He stood in front a classroom full of freshman forestry students, and said he couldn't imagine shooting a wolf. Dogs recognize basic feelings – joy when their masters walk through the door, fear as they cower during a thunderstorm, and pain. As dogs are a subspecies of the wolf, he said, its perceivable that wolves are equally as capable of recognizing pain and terror.

Together with his research partner, Rolf Peterson, Vucetich advocated genetic rescue as a way to save Isle Royale wolves to anyone who would listen – to students in university classrooms, to citizens at public meetings, and, most importantly, to National Park Service representatives.

Genetic rescue, unlike reintroduction, would have meant shipping several wolves to the island to bolster the population. But with only three wolves remaining, genetic rescue is no longer an option.

Vucetich and Peterson now advocate bringing more wolves to the island. The process wouldn't be reintroduction, since three wolves do remain, but it wouldn't be genetic rescue either. While the process might differ, the reasons for intervention to save the Isle Royale wolf population still stand, Vucetich says.

Peterson has been a part of the wolf-moose study since the 1970s. Now retired from teaching, he spends more time on the wild island than he does on the mainland, conducting research and living in a small cabin during the summer tourist season.

For Peterson, protecting the wolves of Isle Royale is about maintaining the overall health of the island. Like antibodies defend the entire body from infection, wolves guard the island from moose overeating and destroying vegetation by keeping the moose population in check.

“Over the long-term average, moose density is going to be lower if wolves are present. And that will allow certain trees to grow, and those trees are important for about everything in the park,” Peterson said. If moose aren’t kept in check through predation, they could change the entire island’s vegetation composition.

On Isle Royale, predators haven’t functioned properly for the last four years. The four lowest annual predation rates on record occurred from 2012 to 2015, the same years of lowest wolf abundance. During that same time period, the moose population more than doubled to 1,250. This means that there aren’t enough wolves left to manage the moose population.

If predation isn’t restored, the health of the island ecosystem is jeopardized. It’s likely some tree species will eventually blimp out of existence on the island because of the effects of heavy moose browse. Small balsam fir trees, especially, won’t grow into the canopy – though balsam fir currently dominates the island vegetation and is a cornerstone for the island’s food web.

If wolves disappear for good, reintroducing new wolves later on doesn’t necessarily mean that the moose-caused damage disappears.

“Moose can commit damage in just about five years, but the damage they do won’t be undone for a very long time, upwards of a century,” Vucetich says.

For Vucetich, restoration is also about righting a wrong. Wolves should be brought to the island because humans, not nature, have caused the wolves’ impending extinction, he says.

Federally designated wilderness areas, including Isle Royale, are managed by the principle of non-intervention under the Wilderness Act. Nature is most often left to its own business, except when people mess up those natural conditions. In that case, managers can intervene to restore them.

Vucetich says the sick wolves of Isle Royale are an obvious result of human-caused harm, primarily climate change.

Vucetich says the recent wolf decline was caused by a chain of events that began when canine parvovirus was accidentally brought to the island by tourists in the early 1980s. The disease, which causes vomiting, diarrhea, weight loss, and eventually death in dogs, decimated the population. From 1980 to 1982, the number of wolves fell from 50 to 14.

Compounded by other factors including a decline in food availability, population numbers stayed low for over a decade. Vucetich and Peterson call it the “single most significant event” in the story of the wolves and moose on Isle Royale, because it bottlenecked the wolf

population and accelerated inbreeding depression. Conditions only improved when Old Grey Guy arrived in 1997.

But only three ice bridges, including those of the past two winters, have formed since Old Gray Guy's arrival.

"The island used to be connected to the mainland by ice three years out of four in the 1960s. Now that's declined to maybe one year out of 15 or so. So the connectivity that kept the wolf population going for all these decades is now a thing of the past," Peterson said.

According to NOAA, ice coverage on the Great Lakes has drastically declined, on average, over the past 40 years – down by about 70 percent in some places. Between 1979 and 2006, Lake Superior's surface temperature has risen by 4.5 degrees, and the lake's average ice cover has diminished from 23 percent to 12 percent over the last century, according to Minnesota Sea Grant.

From Vucetich's viewpoint, the climate change humans have caused justifies bringing wolves to Isle Royale. Without it, the wolves will die out.

For Vucetich, the two new wolves' short jaunt to and from Isle Royale this winter from mainland Minnesota is not optimistic. It's unlikely that the new wolves came into contact with Isle Royale wolves, and even if they had, it's unlikely that natural genetic rescue would have occurred, he says.

The two adult wolves on Isle Royale are likely a mated pair and wouldn't break up to take a new mate, says Vucetich. "They're happy. They're content. They don't know they have a problem," he said. Alternatively, wolves have the ability to detect inbreeding and usually avoid it, so the visiting wolves could have decided that the Isle Royale wolves weren't worthwhile mates.

Instead, Vucetich focuses on the drastic loss in wolf numbers the last year has brought. It's possible, but unlikely, that some wolves left via ice bridges this winter, he and Peterson write in the 2015 annual report. Though still marked by uncertainty, it's more likely the wolves died which, in the worst case, would mark a 70 percent mortality rate this year, the highest in recorded Isle Royale history.

Watch and wait

To many, bringing wolves to Isle Royale seems an obvious solution. But for others, it's not so simple.

L. David Mech is a renowned wolf expert and a senior wolf biologist with the U.S. Geological Survey. He's authored numerous papers and books about wolves, including the 1996 book *The Wolves of Isle Royale*. Mech is also the leading face of "watchful waiting" on Isle Royale, a smaller and seemingly less vocal contingent of wolf scientists and park officials who suggest caution because of the uncertain impacts of a changing climate.

Unlike others, who believe canine parvovirus is the major cause of the 1980s population crash, Mech believes the decline was caused more by malnutrition and strife than by

lingering effects of disease. In his view, humans did not cause the decline, which would free people from much of the moral obligation to intervene.

Mech called the concern over ecosystem health premature and said the wolf population could survive for many years on Isle Royale, despite the predation data quoted by opposing scientists. Isle Royale wolves have bounced back from crisis before, he said, and could again.

For Mech the two new wolves travelling to Isle Royale this winter also validated his belief that scientists should not interfere. Perhaps wolves are traveling to Isle Royale more often than scientists believed. And maybe we don't have a clear picture of the future of ice connecting the island to the mainland.

It's unknown exactly how climate change will affect ice bridges, Mech points out. While reducing overall ice coverage, climate change is also predicted to increase more intense weather events, which could theoretically increase the chances of ice bridges forming.

"If there was an ice bridge this year and we know there was one last year, two out of two winters make you wonder, you know, whether the idea that we're not getting as many ice bridges as we used to, that might be wrong," he said.

Mostly, though, it's about the chance to learn, Mech said.

"I think that from a scientific standpoint, we stand to learn the most by just seeing what the wolf population does as long as we can," Mech says. "I mean, the population has been studied for about 60 years now, without human intervention. It's a matter of judgment, but my judgment is that we learn more if we continue to just observe the population and see what happens. Once we intervene, then forever after that we don't have a natural population."

Isle Royale wolves are useful to science as a comparison to other populations like Yellowstone, he said.

For Mech, the ethical difference between performing genetic rescue on Isle Royale and the reintroduction of Yellowstone wolves is simple: it's about human involvement.

"In Yellowstone, humans depleted the wolf population there, and therefore, ethically, it was proper for humans to intervene by restoring them. On Isle Royale, if the wolves go extinct, it's basically a natural phenomenon, so there's no reason to intervene unless it finally does go extinct...."

Other concerns from the watchful waiters are more logistical. Is human intervention even justifiable under the Wilderness Act in this situation? If yes, human intervention opens up a Pandora's box of management concerns and questions. Where would new wolves come from? When would they be brought? Would one release be enough to restore balance, or would the process have to be played out again and again for years to come? Can you even define what success would look like? To some, it seems that Vucetich and Peterson's rally cry lacks a definitive plan.

It's also true that on a larger landscape level lots of different populations interact, a theory called metapopulations. Populations may blink in and out of existence on a local level, a sort of boom-and-bust cycle, but some say it's better to consider the health of the population as a

whole. This winter, for example, three wolves from mainland Ontario crossed Lake Superior 186 miles away from Isle Royale and recolonized Michipicoten Island, which is uninhabited by humans. Scientists believe they have bred. The colonization of Michipicoten stands as a counter point to Isle Royale's pending wolf extinction. While one population might be dying, another might very well just be beginning on a nearby island.

The National Park Service punts

At the end of the day, the National Park Service will determine the fate of the Isle Royale wolves. And so far, it seems to agree with the watchful waiting contingent.

In April 2014, Isle Royale National Park officials announced that, for now, they would not bring wolves to the island. Instead, they would study, watch, and plan. In a press release, Phyllis Green, the park's superintendent, said the park would respond to the low wolf population by beginning a comprehensive planning process and environmental analysis that would take into account wolves, moose, and island vegetation, and could take up to three years to complete.

Green said that the park is charged with a larger stewardship than just wolves. And while there weren't immediate plans to bring new wolves to the island, there was still time to consider the consequences.

Genetic rescue advocates were baffled by the decision.

"The park's view has been a little hard to understand," Vucetich said. "Most people are in agreement that wolves are suffering tremendously from inbreeding depression."

A year later, with only three wolves left on Isle Royale, Green said the park's plans are unchanged.

Park officials and scientists still don't know what happened to four of the nine wolves included in the last year's census, Green said. They could have been missed in the census count, died, or perhaps left the island via ice bridge.

"Wolves do move, you know," she said.

For now, she says the park will wait and see what happens to the last breeding pair.

"The most important thing is that it's a bigger puzzle than you know," says Liz Valencia, the park's chief of interpretation and cultural resources. "The dynamics are more than just wolf numbers."

The park must account for vegetation, moose populations, future effects of climate change, the overall ecosystem of Isle Royale, and the influence of Lake Superior.

All of those factors are related, Valencia says, and climate change will impact everything. But despite scientific modeling, it's difficult to predict exactly how.

"It's all related," she says. "The number of wolves is just one tiny piece of that whole puzzle."

The case of the disappearing pup

At 4 a.m. on March 5, researchers hooked Flagship up to the generator on the last day of the 2015 winter study. It was -23 degrees. By daybreak, the plane was finally ready and the skies were clear.

On the edge of Lake Richie, an elusive kill site was hidden away underneath a dense cover of fir trees. The body of a cow moose rested, cold and half devoured. Only the stiff, frozen hide and lower legs remained.

The site was littered with feces, which later that day Peterson would collect for genetic analysis after he cross-country skied to the site. For now, though, the place still belonged solely to the remaining wolves of Isle Royale. The moose had fed them for many days, and it would continue to feed them for some days more, the eerily beautiful way that death sometimes nourishes life.

For now, whether the Isle Royale wolves themselves live or die remains to be seen. Debates may ensue over whether or not their initial decline leading to this point is human-caused, but the decision of their fate from here on out now rests in human hands.

Green says park officials are still working in the background on the legwork of the planning process. They plan to release a notice of intent in the next two months telling the public how it can become involved in the planning process.

In a few years, a management decision will eventually, carefully, practically be made. But, for now, it seems that indecision and apathy are, perhaps, decisions in themselves.

The little plane buzzed toward the kill site, searching, but the wolves weren't there. Not then. They were on the other side of Lake Richie, padding silently across the ice. Their bellies were bulged, full.

If they looked up, they might have noticed the small plane, but if they noticed they didn't stop. They walked forward, silhouetted against a backdrop of tall balsam fir trees, until they slinked into the vegetation's thick cover.

There were only two of them this time, the adults from the Group of Three. The deformed pup was nowhere to be seen. Maybe it was elsewhere, a lone figure as it was the first time researchers caught sight of him. Maybe it was dead.

Maybe the distinction didn't even matter. If it wasn't dead yet, it probably would be soon. Then, the pup would only exist in words, in story— a legend of a hunched back, of twisted bones, of an island broken.